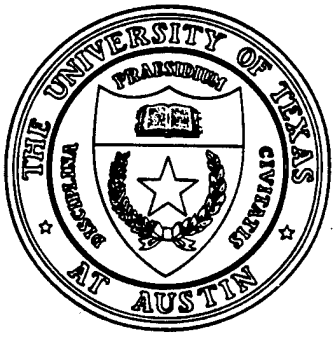
FINAL REPORT ON ELECTRONICS RESEARCH AT THE UNIVERSITY OF TEXAS AT AUSTIN

NO. 58

For the period August 1, 1995 through August 31, 1998

JOINT SERVICES ELECTRONICS PROGRAM

Research Contract AFOSR F49620-95-C-0045



November 30, 1998

ELECTRONICS RESEARCH CENTER

Bureau of Engineering Research
The University of Texas at Austin
Austin, Texas 78712-1084

REPORT DOCUMENTATION PAGE

AFRL-SR-BL-TR-99-

0102

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	November 30, 1998	Final Report 1 Aug. 1995 - 31 Aug. 1998

4. TITLE AND SUBTITLE

Final Report on Electronics Research at The University of Texas at Austin

5. FUNDING NUMBERS

Research Contract
AFOSR
F49620-95-C-0045
Project/Task 2305/A9
Prog. Elem. 61102F

6. AUTHOR(S)

Edward J. Powers and seven faculty associated with the Joint Services Electronics Program at The University of Texas at Austin

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

The University of Texas at Austin
Electronics Research Center
Austin, Texas 78712-1084

8. PERFORMING ORGANIZATION REPORT NUMBER

No. 58

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

Air Force Office of Scientific Research
Building No. 410
Bolling AFB, DC 20332
Program Manager: Major Michael W. Prairie
AFOSR/NE

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for Public Release
Distribution Unlimited

12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

This report summarizes scientific progress on "Basic Research in Electronics" which has been conducted under the auspices of the DoD Joint Services Electronics Program during the period 1 August 1995 - 31 August 1998. Progress on five solid-state, two information electronics, and one electromagnetic project is described.

14. SUBJECT TERMS

Information electronics, electromagnetics, and solid-state electronics

15. NUMBER OF PAGES

23

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	

FINAL REPORT ON ELECTRONICS RESEARCH AT THE UNIVERSITY OF TEXAS AT AUSTIN

NO. 58

For the period August 1, 1995 through August 31, 1998

JOINT SERVICES ELECTRONICS PROGRAM

Research Contract AFOSR F49620-95-C-0045

Submitted by Edward J. Powers

on behalf of the Faculty and Staff

of the Electronics Research Center

November 30, 1998

ELECTRONICS RESEARCH CENTER

Bureau of Engineering Research
The University of Texas at Austin
Austin, Texas 78712-1084

FINAL REPORT: JOINT SERVICES ELECTRONICS PROGRAM
CONTRACT AFOSR F49620-95-0045
The University of Texas at Austin

Research carried out under the auspices of this contract consisted of five research units in Solid State Electronics, one in Electromagnetics, and two in Information Electronics.

The objective of the Solid State Electronics program is to develop new materials and devices for electronic and photonic applications, based on an enhanced underlying knowledge of those materials and devices. To accomplish this task, a group of five faculty was assembled representing basic materials studies, transport and device theory and simulation, multilayer heterostructure growth, and device fabrication. The research is a coherent, cooperative program, with considerable synergy among the investigators. The MBE growth of multilayer heterostructures is used in the development of vertical cavity surface-emitting lasers (VCSEL), and in building novel microcavity photodetectors. Underlying all of these materials and device studies are theory and simulation contributions and femtosecond optical probes. Because of the progression from materials to devices provided by this research team, the research benefits from immediate feedback from measurements and device studies of the heterostructures under development.

A new understanding of MBE growth was achieved, and this understanding was applied to growth of high-quality multilayer heterostructures. Recent progress relating to VCSEL's involved three areas related to optical emitters and devices based on Fabry-Perot microcavities. These are further development of the theoretical modeling, development of a new form of dielectrically appertured VCSEL, and finally an initial investigation of the cavity effect on controlled spontaneous lifetime. New photodetectors have been designed, fabricated, and characterized to achieve enhanced performance relative to conventional photodetectors. Development and characterization of models and tools for the study of charge transport in semiconductors on ultra-short spatial and temporal scales were carried out. Advances in femtosecond laser technology were used to achieve the dual aim of advancing basic scientific understanding of Column IV semiconductor interfaces, on the one hand, and of addressing urgent technological needs for improved interface diagnostics in the silicon microelectronics industry, on the other.

In formulating the electromagnetics and information electronics components of this program, special emphasis was placed on developing a synergistic set of units. The common theme these units involve the development and application of advanced signal processing techniques to problems involving electromagnetic scattering, radar signal processing (superresolution direction finding, signal detection, and classification), increasing existing communication channel capacity, and modeling and mitigation of undesirable nonlinear effects in communication and other systems. The advanced signal processing techniques include, but are not limited to, wavelet transforms, superresolution techniques, higher-order statistics, adaptive frequency-domain Volterra filters, neural networks, and fast algorithm development.

Specifically, joint time-frequency signal processing has been exploited as a means of analyzing electromagnetic backscattered data from complex targets. Such techniques provide additional insight into the scattering phenomenology associated with such targets. High performance signal processing technqiues have been developed to significantly increase the capabilities of wireless communication systems. A new parallel-adaptive predistorter to compensate nonlinearities introduced by high-power amplifiers in communication systems has been developed. The use of such predistorter-type linearizers allows the high-power amplifier to be operated a smaller back-off, and thus higher output power.

PRINCIPAL INVESTIGATORS

Professor Joe C. Campbell

Professor Dennis G. Deppe

Professor Michael C. Downer

Professor Hao Ling

Professor Christine M. Maziar

Professor Edward J. Powers

Professor Ben G. Streetman

Professor Guanghan Xu

Ph.D. Dissertations

Eyink, Kurt, Ph.D. "Microstructural Changes in MBE Growth of LT-GaAs Observed by In-Situ Ellipsometry," May 1995 (Streetman)

Shaheed, M. Reaz,Ph.D., "Modeling and Simulation of Si- and SiGe-Base Bipolar Transistors Operating at a Wide Range of Temperatures," May 1995 (Maziar)

Srinivasan,, Anand, Ph.D., "Growth and Characterization of Low-Temperature Grown GaAs and Resonant Cavity Structures," May 1995 (Streetman)

Dadap, Jerry I., Ph.D., "Optical second-harmonic electro- and thermoreflectance spectroscopy of Si(001)/SiO_2, H-Si(001), and Si(001)-2x1 interfaces by femtosecond pulses," August 1995 (Downer)

Eun, C.S., Ph.D., "Design and Comparison of Nonlinear Compensators," December 1995 (Powers)

Trintinalia,, L.C., Ph.D., "Time-frequency analysis of backscattering from inlet cavities embedded in Complex targets," August 1996 (Ling)

Deng, Hongyu, Ph.D., "Transverse Mode Confinement in Vertical-Cavity Surface-Emitting Lasers," The University of Texas at Austin, December 1996 (Deppe)

Rashed, Md. Mahbub Bin, Ph.D., "Monte Carlo Study of Transport in Strained Silicon and Silicon-Germanium Based Devices," December 1996 (Maziar)

Anselm, Klaus A., Ph.D., "High Performance Resonant-Cavity-Enhanced Photodiodes grown by Molecular Beam Epitaxy, " May 1997 (Streetman)

Jeng, S.S., Ph.D., "Channel Propagation Study of SDMA Schemes for Wireless Communications," The University of Texas at Austin, June 1997 (Xu)

Hu, X.F., Ph.D., "Femtosecond second harmonic and ellipsometric spectroscopy of silicon-germanium interfaces," August 1997 (Downer)

Lee,Y.S. Ph.D., "Optical fourth harmonic generation at crystalline surfaces," December 1997 (Downer)

Hansen, L., Ph.D., "The Hypercube algorithm: A sequential algorithm for separating synchronous M-ASK or QAM co-channel signals," May 1998 (Xu)

Okomoto, Garret, Ph.D., "The Smart Wireles LAN System: Adapting SDMA for Wireless LANs," June 1998 (Xu)

Peskin, Mark A., Ph.D., "Monte Carlo Simulation of Impact Ionization in III-V Compound Avalance Photdiodes," May 1998 (Maziar)

Grimes,M.K, Ph.D., "Vacuum heating and expansion of solid surfaces by intense femtosecond laser irradiation," August 1998 (Downer)

Kwan,W.M. H., Ph.D., "Parallel Implementation of a Fast Third-Order Volterra Digital Filter," August 1998 (Powers)

Yoo, H., Ph.D., "Quality of the Volterra Transfer Function Estimation," August 1998 (Powers)

MS Theses

Peskin, Mark A., M.S., "Monte Carlo Evaluation of Energy Transport Parameters for an Accurate High-Field Energy-Balance Model of Charge Transport in GaAs," May 1995 (Maziar)

Filindras, A., M.S., "Scattering from conductor-backed dielectric slabs: simulation and time-frequency phenomenology interpretation," August 1995 (Ling)

Torlak, M., M.S., "Smart Antennas for CDMA Systems, Nov. 1995 (Xu)

Ozdemir, C., M.S., "Scattering from dielectric-coated wire: simulation and time-frequency phenomenology interpretation," December 1995 (Ling)

Cheng, C.-H., M.S., "A Comparison Between pth-order Inverse Equalizers and Predistorters," August, 1996 (Powers)

Mehta, S.P., M.S., "Wavelet Based Higher-Order Time-Scale Analysis and its Applications," August 1996 (Powers)

K.V. Phanasalkar, K.Y., M.S., "Comparison of Neural Network Based Predistorters and Equalizers in the Presence of Noise," August 1996 (Powers)

Wang, Y., M.S., "Multimode parameter extraction for general multiconductor transmission line via FDTD method and signal processing techniques," August 1996 (Ling)

Zhu, J.–D., M.S., "Application of Nonlinear Signal Processing Techniques in Telecommunication Network Modeling," August 1996 (Powers)

Anderson,M.H, M.S., "Fourth harmonic spectroscopy of semiconductor surfaces," M.S., December 1996, (Downer)

Mathew, Nevin, M.S., "Linewidth of a Homogeneously Broadened Bad Cavity Laser," The University of Texas at Austin, December 1996 (Deppe)

Trump,C.E., M.S., "Femtosecond frequency domain interferometer for probing laser-induced phase transitions in silicon," December 1996 (Downer)

Baklenov, Oleg, M.S., "Growth of Quantum Dots by Molecular beam Epitaxy," May 1997 (Streetman)

Lenox, Chet, M.S., "The Use of the Native Oxide of Aluminum Gallium Arsendie in Optoelectronic Devices Grown by Molecular Beam Epitaxy," May 1997 (Streetman)

Büngener, R., M.S., "Si/Ge epitaxial growth surface monitoring by second harmonic generation," August 1998 (Downer)

Düsterer,S. M.S., "Femtosecond time-resolved measurements of thermal demagnetization," August 1998 (Downer)

Kempf,R., M.S., "Second, third and fourth harmonic generation at Si(110) and Si(111) surfaces," August 1998 (Downer)

A1. Publications in Reviewed Journals

A Srinivasan, S. Murtaza, K. Anselm, Y.C. Shih, J.C. Campbell, and B.G. Streetman, "MBE Growth of Multiple-Wavelength Mirrors and Applications for a Dual-Wavelength Resonant-Cavity Photodetector," J. Vac. Sci. and Techn. B13, 765-767 (March/Apr., 1995).

S.S. Murtaza, I-H. Tan, R.V. Chelakara, R. Islam, A. Srinivasan, K.A. Anselm, J.E. Bowers, E.L. Hu, R.D. Dupuis, B.G. Streetman, and J.C. Campbell, "High-Efficiency Dual-Wavelength, Water-Fused Resonant-Cavity Photodetector Operating at Long Wavelengths, "IEEE Photonics Letters 7, 679-681 (June, 1995).

A.R. Smith, K.-J. Chao, C.K. Shih, Y.C. Shih, K.A. Anselm, and B.G. Streetman, "Influence of Various Growth Parameters on the Interface Abruptness of AlAS/GaAs Short Period Superlattices," J. Vac. Sci. and Techn. B 13, 1824-1829 (July/August, 1995).

J.C. Campbell, S.S. Murtaza, K.A. Anselm, A. Srinivasan, B.G. Streetman, J.C. Bean, and L.J. Peticolas, "Novel High-Reflectivity Bragg Mirrors and Resonant-Cavity Photodiodes," J. Korean Physical Soc. 28, S26-S31 (1995).

S.S. Murtaza, K.A. Anselm, A. Srinivasan, B.G. Streetman, J.C. Campbell, J.C. Bean, and L.J. Peticolas, "High-reflectivity Bragg Mirrors for Optoelectronic Applications," IEEE J. Quantum Electronics 31, 1819-1825 (October, 1995).

S.S. Murtaza, K.A. Anselm, C. Hu, H. Nie, B.G. Streetman, and J.C. Campbell, "Resonant Cavity Enhanced (RCE) Separate Absorption and Multiplication (SAM) Avalanche Photodetector (APD), "IEEE Photonics Technology Letters 7, 1486-1488 (Dec., 1995).

K.A. Anselm, S.S. Murtaza, C. Hu, H. Nie, B.G. Streetman and J.C. Campbell, "A Resonant-Cavity, Separate-Absorption-and-Multiplication, Avalanche Photodiode with Low Excess Noise Factor," IEEE Electron Device Letters 17, 91-93 (March 1996).

K.A. Anselm, S.S. Murtaza, C. Hu, J.C. Campbell, B.G. Streetman, "MBE Growth of Resonant-Cavity Separate-Absorption-and-Multiplication Avalanche Photodiodes, "J. Vac. Sci. and Techn. B 14, 2256-2258 (May/June 1996).

S.S. Murtaza, I-H. Tan, J.E. Bowers, E.L. Hu, K.A. Anselm, M.R. Islam, R.V. Chelakara, R.D. Dupuis, B.G. Streetman, and J.C. Campbell, "High-Finesse Resonant-Cavity Photodetectors with and Adjustable Resonance Frequency," J. Lightwave Technology 14, 1081-1089 (June, 1996).

C. Hu, K.A. Anselm B.G. Streetman, J.C. Campbell, "Noise Characteristics of Thin Multiplication Region GaAs Avalanche Photodiodes," *Appl. Phys. Lett.*, Vol. 69, No. 24, pp. 3734-3736, 1996.

H. Nie, K. A. Anselm, C. Hu, S. Murtaza, B. Streetman, J. Campbell, "High-Speed Resonant-Cavity Separate Absorption and Multiplication Avalanche Photodiodes with 130GHz Gain-Bandwidth Product," Appl. Phys. Lett., Vol. 70, No. 2, pp. 161-163, 1997.

G. Kinsey, C. Lenox, H. Nie, J. C. Campbell, and B. G. Streetman, "Resonant Cavity Photodetector with Integrated Spectral Notch Filter," *Photonics Technology Letters* 10(8), 1142 , 1998.

H. Nie, O. Baklenov, P. Yuan, C. Lenox, B.G. Streetman, and J.C. Campbell, "Quantum-Dot Resonant-Cavity Separate Absorption, Charge and Multiplication Avalanche Photodiode Operating at 1.06 μm," *Photonics Technology Letters* 10(7), 1009 -1011,1998.

O. Baklenov, H. Nie, K. Anselm, J.C. Campbell, and B.G. Streetman, "Multi-stacked Quantum Dot Resonant-Cavity Photodetector Operating at 1.06 μm", Electronics Letters 34(7), 694 ,1998.

D.G. Deppe, D.L. Huffaker, J. Shin, and Q. Deng, "Very-low-threshold index-confined planar microcavity lasers," *IEEE Phot. Tech. Lett.*, vol. 7, pp. 965-967 (September, 1995).

D.L. Huffaker and D.G. Deppe, "Spontaneous Coupling to Planar and Index-Confined Quasi-Modes of Fabry-Perot Microcavities," *Appl. Phys. Lett.*, vol. 67, 2594-2596 (30 October, 1995).

H. Deng, Q. Deng, D.G. Deppe, D.L. Huffaker, and J. Shin, "Transverse and temporal mode dependence on mirror contrast in microcavity lasers," *IEEE J. Quant. Electron.*, vol. 31, pp. 2026-2036 (November, 1005).

T.-H. Oh, D.L. Huffaker, L.A. Graham, H. Deng, and D.G. Deppe, "Steam Oxidation of GaAs," Electron. Lett. 32, 2024-2026 (10 October, 1996).

T.-H. Oh, D.L. Huffaker, and D.G. Deppe, "Size Effects in Small Oxide Confined Vertical-Cavity Surface-Emitting Lasers," Appl. Phys. Lett. 69, 3152-3154 (18 November, 1996).

H. Deng, Q. Deng, and D.G. Deppe, "Native-Oxide-Confined Whispering-Gallery Mode Laser With Vertical Emission," Appl. Phys. Lett. 69, 3120-3122 (18 November, 1996).

H. Deng, Q. Deng, and D.G. Deppe, "Very Small Oxide-Confined Vertical-Cavity Surface-Emitting Lasers with a Bulk Active Region," Appl. Phys. Lett. 70, 741-743 (10 February, 1997).

D.L. Huffaker, H. Deng, and Q. Deng, and D.G. Deppe, "Ring and Stripe Oxide-Confined Vertical-Cavity Surface-Emitting Lasers," Appl. Phys. Lett. 69, 3477-3479 (2 December, 1996).

(Invited) D.G. Deppe, D.L. Huffaker, H. Deng, Q. Deng, and T.-H. Oh, "Ultra-Low Threshold Current Vertical Cavity Lasers for Photonic Integrated Circuits," IEICE Trans. Electron. E80-C, 664-674 (May, 1997).

Q. Deng, H. Deng, and D.G. Deppe, "Emission Characteristics of Whispering-Gallery Modes From Oxide-Confined Vertical-Cavity Surface-Emitting Lasers," Opt. Lett. 22, 463-465 (1 April, 1997).

D.G. Deppe and D.L. Huffaker, "High Spatial Coherence Vertical-Cavity Surface-Emitting Laser Using a Long Monolithic Cavity," Electron. Lett. 33, 211-213 (30 January, 1997).

L.A. Graham, D.G. Deppe, and D.L. Huffaker, "Exciton Spectral Splitting Near Room Temperature From High Contrast Semiconductor Microcavities," Appl. Phys. Lett. 70, 814-816 (17 February, 1997).

D.L. Huffaker and D.G. Deppe, "Low Threshold Vertical-Cavity Surface-Emitting Lasers Based on High Contrast Distributed Bragg Reflectors," Appl. Phys. Lett. 70, 1781-1783 (7 April, 1997).

D.L. Huffaker, T.-H. Oh, and D.G. Deppe, "Tunnel Injection Active Region in an Oxide-Confined Vertical-Cavity Surface-Emitting Laser," IEEE Phot. Tech. Lett. 9, 716-718 (June, 1997).

D.G. Deppe, T.-H. Oh, and D.L. Huffaker, "Eigenmode Confinement in the Dielectrically Apertured Fabry-Perot Microcavity," IEEE Phot. Tech. Lett. 9, 713-715 (June, 1997).

D.L. Huffaker, O. Baklenov, L.A. Graham, B.G. Streetman, and D.G. Deppe, "Quantum Dot Vertical-Cavity Surface-Emitting Laser With a Dielectric Aperture," Appl. Phys. Lett. 70, 2356-2358 (5 May, 1997).

D.G. Deppe and Q. Deng, "Self-Consistent Eigenmode Analysis of the Dielectrically-Apertured Fabry-Perot Microcavity," Appl. Phys. Lett. 70, 160-162 (14 July, 1997).

D.L. Huffaker, L.A. Graham, and D.G. Deppe, "Low-Threshold Continuous-Wave Operation of an

Oxide-Confined Vertical-Cavity Surface-Emitting Laser Based on a Quantum Dot Active Region and Half-Wave Cavity," Electron. Lett. 33, 1225-1226 (1997).

T.-H. Oh, D.L. Huffaker, and D.G. Deppe, "Comparison of Vertical-Cavity Surface-Emitting Lasers Based on Half-Wave Cavity Spacers and Confined by Single or Double Apertures," IEEE Phot. Tech. Lett. 9, 875-877 (July, 1997).

T.-H. Oh, M.R. McDaniel, D.L. Huffaker, and D.G. Deppe, "Cavity-Induced Antiguiding in a Selectively-Oxidized Vertical-Cavity Surface-Emitting Laser," IEEE Phot. Tech. Lett. 10, 12-14, January, 1998.

T.-H. Oh, O.B. Shchekin, and D.G. Deppe, "Single-Mode Operation in an Antiguided Vertical-Cavity Surface-Emitting Laser Using a Low-Temperature Grown AlGaAs Aperture," IEEE Phot. Tech. Lett. 10, 1064-1066 , 1998.

J.C. Campbell, D.L. Huffaker, H. Deng, and D.G. Deppe, "Quantum Dot Resonant Cavity Photodiode With Operation Near 1.3μm Wavelength," Electron. Lett. 33, 1337-1339, 17 July, 1997.

D.G. Deppe, A. Kudari, D.L. Huffaker, H. Deng, Q. Deng, and J.C. Campbell, "Mode Coupling in a Narrow Spectral Bandwidth Quantum Dot Microcavity Photodetector," IEEE Phot. Tech. Lett. 10, 252-254, February, 1998.

Q. Deng and D.G. Deppe, "Self-Consistent Calculation of the Lasing Eigenmode of the Dielectrically Apertured Fabry-Perot Microcavity," IEEE J. Quant. Electron. 33, 2319-2326 , December, 1997.

O. Baklenov, D.L. Huffaker, A. Anselm, D.G. Deppe, and B.G. Streetman, "Influence of Al Content on Formation of InGaAlAs Quantum Dots Grown by Molecular Beam Epitaxy," J. Appl. Phys. 82, 6362-6364 , 15 December, 1997.

(Invited) Q. Deng and D.G. Deppe, "Spontaneous Lifetime Change in a Dielectrically-Apertured Fabry-Perot Microcavity," Optics Express 2, 157-162 ,1998.

L.A. Graham, D.L. Huffaker, Q. Deng, and D.G. Deppe, "Controlled Spontaneous Lifetime in Microcavity Confined InGaAlAs/GaAs Quantum Dots," Appl. Phys. Lett. 72, 1670-1672, (6 April, 1998.

S.S. Murtaza, J.C. Campbell, and J.C. Bean, "Theory of Reflectivity of an Asymmetric Mirror," Applied Optics, 35, 2054-2059, 1996.

J. Sarathy, D.C. Diaz, and J.C. Campbell, "Crystallographically-Limited Sub-Micron Gratings in (100) and (211) Silicon," Opt. Lett., 20, 1216-1218 ,1996.

A.Srinivasan, S.S. Murtaza, J.C. Campbell, and B.G. Streetman, "High Quantum Efficiency Dual Wavelength Resonant-Cavity Photodetector," Appl. Phys. Lett., 66, 535-537 , 1995.

S.S. Murtaza, H. Nie, J.C. Campbell, J.C. Bean, and L.J. Peticolas, "Short-Wavelength, High-Speed, Si-based Resonant-Cavity Photodetector," IEEE Photon. Tech. Lett., 8, 927-929 ,1996.

J. Sarathy, K.A. Anselm, B.G. Streetman, and J.C. Campbell, "Narrow linewidth tunable distributed feedback photodetector, "Applied Physics Letter, vol. 69, pp. 3123-3124, 1996.

X. Ren and J. C. Campbell, "Theory and Simulations of Tunable Two-Mirror and Three-Mirror Resonant-Cavity Photodetectors with a Built-In Liquid-Crystal Layer," IEEE Journal of Quantum Electronics, vol. 32, pp. 1903-1915, 1996.

S.S. Murtaza, R.V. Chelakara, R.D. Dupuis, J.C. Campbell, and A.G. Dentai, "Resonant-cavity photodiode operation at 1.55 with Burstein-shifted As/InP reflectors," Applied Physics Letters, vol. 69, pp. 2462-2464, 1996.

C. Hu, K.A. Anselm, B.G. Streetman, and J.C. Campbell, "Excess Noise in GaAs Avalanche Photodiodes with Thin Multiplication Regions," Journal of Quantum Electronics, Vol. 33, pp. 1089-1093, 1997.

M.A. Parent, S.S. Murtaza, and J.C. Campbell, "Analytic solution for the peak reflectivity of an asymmetric mirror," Applied Optics, vol. 36, pp. 4265-4268, 1997.

J.C. Bean, C.L. Schow, R. Li, H. Nie, J. Schaub, and J.C. Campbell, "High Speed polysilicon resonant-cavity photodiode with Bragg reflectors," Photonics Technology Letters, vol. 9, pp. 836-838, 1997.

D.C. Diaz, C.L. Schow, Jieming Qi, and J.C. Campbelll, "Si/Sio_2 resonant cavity photodetector," Appl. Phys. Lett., vol. 69, pp. 2798-2800 ,1996.

H. Nie, K.A. Anselm, C. Lenox, P. Yuan, C. Hu, G. Kinsey, B.G. Streetman, and J.C. Campbell, "Resonant-cavity separate absorption, charge and multiplication avalanche photodiodes with high speed and high gain-bandwidth product," IEEE Photon. Tech. Lett., vol. 10, pp. 409-411, 1998.

K. A. Anselm, H. Nie, C. Hu, C. Lenox, P. Yuan, G. S. Kinsey, J. C. Campbell, and B. G. Streetman, "Performance of Thin Separate Absorption, Charge, and Multiplication Avalanche Photodiodes," J. Quantum Electron., vol. 34, pp. 490, 1998.

G. Kinsey, C. Lenox, H. Nie, J. C. Campbell, and B. G. Streetman, "Resonant-Cavity Photodetector with Integrated Spectral Notch Filter," IEEE Photon. Tech. Lett., vol. 10, pp. 1142-1144,1998.

K. A. Anselm, H. Nie, C. Lenox, C. Hansing, J. C. Campbell, and B. G. Streetman, "Resonant-Cavity-Enhanced Avalanche Photodiodes Grown by Molecular Beam Epitaxy on InP for Detection near 1.55 μm," J. Vac. Sci. Tech. B, vol. 16, pp. 1426-1429,1998.

S. Jallepalli, M. Rashed, W. K. Shih, C. M. Maziar and Al F. Tasch, Jr., "A full-band Monte Carlo Model for hole transport in silicon," Journal of Applied Physics, vol. 81, no. 5, pp. 2250-2255, March 1, 1997.

J.I. Dadap, X. F. Hu, N. M. Russell, J. G. Ekerdt, J. K. Lowell, and M. C. Downer, "Analysis of Second Harmonic Generation by Unamplified, High-Repetition-Rate Ultrashort Laser Pulses at Si(001) Interfaces." IEEE Journal of Selected Topics in Quantum Electronics 1, 1145-1155 , 1995.

J. I. Dadap, X. F. Hu, M. H. Anderson, M. C. Downer, J. K. Lowell, and O. A. Aktsipetrov, "Optical second harmonic electroreflectance spectroscopy of a Si(001) metal-oxide-semiconductor structure." Physical Review B 53, R7607-7609 ,1996.

O.A. Aktsipetrov, A.A. Fedyanin, J.I. Dadap, and M.C. Downer, "Dc-electric-field-induced second harmonic generation studies of surfaces and buried interfaces of Column IV semiconductors," Laser Physics 6, 1142-1151 (1996).

J. I. Dadap, P. T. Wilson, M. ter Beek, M. H. Anderson, and M. C. Downer, "Femtosecond carrier-induced screening of dc-electric-field-induced second harmonic generation at the Si(001)/SiO_2 interface," Optics Letters 22, 901-903 (1997).

O. A. Aktsipetrov, A. Fedyanin, Melnikov, J. I. Dadap, X. F. Hu, M. H. Anderson, M. C. Downer, and J. K. Lowell, "DC electric-field-induced second-harmonic generation spectroscopy of the Si(001)-SiO_2 interface: separation of the bulk and surface non-linear contributions," Thin Solid Films 294, 233-235 (1997).

Y.-S. Lee, M. H. Anderson, and M. C. Downer," Fourth harmonic generation at a crystalline GaAs(001) surface," Optics Letters 22,973-975 (1997).

J. I. Dadap, N. M. Russell, X. F. Hu, O. A. Aktsipetrov, J. G. Ekerdt, and M. C. Downer, "Second harmonic spectroscopy of a Si(001) surface during calibrated variations in temperature and hydrogen coverage," Physical Review B 56, 13367-13379 ,1997.

Z. Xu, X.F. Hu, D. Lim, J.G. Ekerdt, and M. C. Downer, "Second harmonic spectroscopy of Si(001) surfaces: sensitivity to surface hydrogen and doping, and applications to kinetic measurements," Journal of Vacuum Science andTechnology B 15, 1059-1064 ,1997.

X. F. Hu, Z. Xu, P. S. Parkinson, D. Lim, B. Gong, G. Hess, J. G. Ekerdt, and M. C. Downer, "In-situ optical second harmonic monitoring of disilane adsorption and hydrogen desorption during epitaxial growth on Si(001)," Applied Physics Letters 71, 1376-1378 ,1997.

Y.-S. Lee and M. C. Downer, "Reflected fourth-harmonic radiation from a centrosymmetric crystal," Optics Letters 23, 918-920 ,1998.

J. Moore, L. C. Trintinalia, H. Ling and G. Xu, "Super-resolved time-frequency processing of wideband radar echo using ESPRIT," Microwave Optical Tech. Lett., vol. 9, pp. 17-19, May 1995.

J. Moore and H. Ling, "Super-resolved time-frequency analysis of wideband backscattered data," IEEE Trans. Antennas Propagat., vol. AP-43, pp. 623-626, June 1995.

H. Kim and H. Ling, "On the efficient representation of Green's function using multiresolution wavelet concepts," Microwave Optical Tech. Lett., vol. 9, pp. 183-187, July 1995.

R. Bhalla and H. Ling, "A fast algorithm for signature prediction and image formation using the shooting and bouncing ray technique," IEEE Trans. Antennas Propagat., vol. AP-43, pp. 727-731, July 1995.

J. Moore and H. Ling, "Super-resolved time-frequency processing of surface wave mechanisms contained in wideband radar echo," Microwave Optical Tech. Lett., vol. 9, pp. 237-240, August 1995.

R. Bhalla and H. Ling, "Image-domain ray-tube integration formula for the shooting and bouncing ray technique," Radio Science, vol. 30, pp. 1435-1446, September-October 1995.

L. C. Trintinalia and H. Ling, "Super-resolved time-frequency parameterization of electromagnetic scattering mechanisms due to structural dispersion," Microwave Optical Tech. Lett., vol. 10, pp. 82-84, October 1995.

L. C. Trintinalia and H. Ling, "Interpretation of scattering phenomenology in slotted waveguide structures via time-frequency processing," IEEE Trans. Antennas Propagat., vol. AP-43, pp. 1253-1261, November 1995.

H. Kim and H. Ling, "A fast multiresolution moment method algorithm using wavelet concepts," Microwave Optical Tech. Lett., vol. 6, pp. 317-319, December 1995.

L. C. Trintinalia and H. Ling, "Extraction of waveguide scattering features using joint time-frequency ISAR," IEEE Microwave and Guided Wave Letters, vol. 6, pp. 10-12, January 1996.

R. Bhalla, H. Ling and H. Nussbaum, "Multi-aspect range profile extrapolation for the shooting and bouncing ray technique," J. Electromag. Waves Applications, vol. 10, pp. 249-268, February 1996.

A. Filindras, U. O. Larsen and H. Ling, "Scattering from the EMCC dielectric slabs: simulation and phenomenology interpretation," J. Electromag. Waves Applications, vol. 10, pp. 515-535, April 1996.

H. Kim, H. Ling and C. Lee, "A fast moment method algorithm using spectral domain wavelet concepts," Radio Science, vol. 31, pp. 1253-1261, September-October 1996.

R. Bhalla and H. Ling, "3D scattering center extraction using the shooting and bouncing ray technique," IEEE Trans. Antennas Propagat., vol. AP-44, pp. 1445-1453, November 1996.

Y. Wang and H. Ling, "Extraction of higher order modes in open microstrip lines via FDTD and joint time-frequency analysis," Microwave Optical Tech. Lett., vol. 13, pp. 319-321, December 1996.

L. C. Trintinalia and H. Ling, "Joint time-frequency ISAR using adaptive processing," IEEE Trans. Antennas Propagat., vol. AP-45, pp. 221-227, February 1997.

R. Bhalla and H. Ling, "Cross range streaks in ISAR images generated via the shooting and bouncing ray technique: cause and solutions," IEEE Antennas Propagat. Mag., vol. 39, pp. 76-80, April 1997.

H. Deng and H. Ling, "Moment matrix sparsification using adaptive wavelet packet transform," Elect. Lett., vol. 33, pp. 1127-1128, June 1997.

C. Ozdemir and H. Ling, "Joint time-frequency interpretation of scattering phenomenology in dielectric-coated wires," IEEE Trans. Antennas Propagat., vol. AP-45, pp. 1259-1264, August 1997.

L.C. Trintinalia, R. Bhalla and H. Ling, "Scattering center parameterization of wide-angle backscattered data using adaptive Gaussian representation," IEEE Trans. Antennas Propagat., vol. AP-45, pp. 1664-1668, November 1997.

R. Bhalla, J. Moore and H. Ling, "A Global scattering center representation of complex targets using the shooting and councing ray technique," IEEE Trans. Antennas Propagat., vol. AP-45, pp. 1850-1856, December 1997.

Y. Wang and H. Ling, "Multimode parameter extraction for multiconductor transmission lines via single-pass FDTD and signal processing techniques," IEEE Trans. Microwave Theory Tech., vol. MTT-46, pp. 89-96, January 1998.

H. Deng and H. Ling, "Efficient representation of moment matrix with pre-defined wavelet packet basis," Elect. Lett., vol. 34, pp. 440-441, March 1998.

Y.Wang, H. Ling and V.C. Chen, "ISAR motion compensation via adaptive joint time-frequency technique," IEEE Trans. Aerospace Electronic Sys., vol. AES-34, pp. 670-677, April 1998.

G. Xu, H. Liu, L. Tong, and T. Kailath, "A Least-Squares Approach to Blind Channel Identification," IEEE Trans. On Signal Processing, Vol. 43, No. 12, Dec. 1995.

H. Liu, G. Xu, L. Tong, and T. Kailath, "Recent Developments in Blind Channel Equalization: From Cyclostationarity to Subspaces," Special Issue on Subspace Signal Processing in IEE Signal Processing Journal, Vol. 50, No. 1-2, April 1996.

L. K. Hansen and G. Xu, "A Fast Sequential Source Separation Algorithm for Digital Cochannel Signals," Vol. 4, No. 2, Feb. 1997.

H. Liu and G. Xu, "Smart Antennas in Wireless Systems: Uplink Multiuser Blind Channel and Sequence Detection," IEEE Trans. On Communications, Vol. 45, No. 2, Feb. 1997.

M. Torlak and G. Xu, "Blind Multiuser Channel Estimation in Asynchronous CDMA Systems, IEEE Trans. On Signal Processing, Vol. 45, Nol. 1, Jan. 1997.

Jeng, G. Xu, H.P. Ling and W.J. Vogel, "Experimental Studies of Spatial Signature Variation at 900 MHz for Smart Antenna Systems," IEEE Trans. On Antenna Propagation, July 1998.

Suard, G.Xu, and H. Liu, "Uplink Channel Capacity of Space-Division-Multiple-Access Schemes," IEEE Trans. on Information Theory, July 1998.

Jeng, G.T. Okamoto, G. Xu, H.P. Lin, and W.J. Vogel, "Experimental Evaluation of Smart Antenna System Performance for Wireless Communications," IEEE Trans. on Antennas and Propagation, Special Issue on Wireless Communications, June 1998.

Kavak, W.J. Vogel, and G. Xu, "Using GPS to Measure Ground Complex Permitivity," Electronics Letters, Vol. 34, No. 3, pp. 54-55, February 1998.

Torlak, G. Xu, B.L. Evans, and H. Liu, "Fast Estimation of Weight Vectors to Optimize Multi-Transmitter Broadcast Channel Capacity," IEEE Trans. on Signal Processing, Vol. 46, No. 1, pp. 243-246, January 1998.

Hansen and G. Xu, "A Hyperplane-Based Algorithm for the Digital Co-Channel Communications Problem," IEEE Trans. on Information Theory, Vol. 43, No. 5, pp. 1536-1548, Sept. 1997.

Ching-Hsing Tseng and Edward J. Powers, "Identification of Cubic Systems Using Higher-Order Moments of I.I.D. Signals," IEEE Trans. on Signal Processing, 43, pp. 1733-1735, July 1995.

Sang-Won Nam and Edward J. Powers, "On the Selective Counting of Third-Order Products," IEEE Transactions on Communications," 43, pp. 2405-2413, August 1995.

Ching-Hsiang Tseng and Edward J. Powers, "Adaptive Estimation of Third-Order Frequency Domain Volterra Kernels," International Journal of Adaptive Control and Signal Processing, pp. 319-342, 1996. (Special issue on Adaptive Signal Processing and Higher-Order Statistics)

Sungbin Im and Edward J. Powers, "A Sparse Third-order Orthogonal Frequency-domain Volterra-like Model," J. Franklin Institute, 333(B), pp. 385-412, 1996. (Special Issue on Higher-Order Statistics in Signal Processing)

S. Im and E.J. Powers, "A Fast Method of Discrete Third-Order Volterra Filtering," IEEE Trans. on Signal Processing, Vol. 44, pp. 2195-2208, September 1996.

S. Im and E.J. Powers, "A Block LMS Algorithm for Third-Order Frequency-Domain Volterra Filters," IEEE Signal Processing Letters, Vol. 4, pp. 75-78, March 1997.

C. Eun and E.J. Powers, "A New Predistorter Based on the Indirect Learning Architecture," IEEE Transactions on Signal Processing, Vol. 45, pp. 223-227, January 1997.

A1a. Books and Book Chapters

S. Im, E.J. Powers and I.-S. Park, "Applications of Higher-Order Statistical Signal Processing to Nonlinear Phenomena," a chapter in Transport, Chaos, and Plasma Physics 2, S. Benkadda, F. Daveil and Y. Elskens, Editors, World Scientific, Singapore, 1996.

B.G. Streetman, J.C. Campbell, and D.G. Deppe, "Microcavity Emitters and Detectors," in Future Trends in Microelectronics: Reflections on the Road to Nano-Technology, S. Lury, editor, Kluwer Press, 1995.

Boualem Boashash, Edward J. Powers, and Abdelhak Zoubir, Editors, Higher-Order Statistical Signal Processing, Longman/Wiley, Melbourne and New York, 1995.

E.J. Powers and S.B. Im, "Introduction to Higher-Order Statistical Signal Processing," Chap. 2 in Higher-Order Statistical Signal Processing (B. Boashash, E.J. Powers and A. Zoubir, Editors), Longman/Wiley, Melbourne and New York, 1995, pp. 3-25.

S.B. Kim and E.J. Powers, "Estimation of Volterra Kernels via Higher-Order Statistical Signal Processing," Chapter 7 in Higher-Order Statistical Signal Processing (B. Boashash, E.J. Powers and A. Zoubir, Editors), Longman/Wiley, Melbourne and New York, 1995, pp. 213-239.

R.W. Miksad, M.R. Hajj and E.J. Powers, "A Review of Polyspectral Measurements and Analysis of Nonlinear and Parametric Interactions During Transition to Turbulence," Chapter 12 in Higher-Order Statistical Signal Processing (B. Boashash, E.J. Powers and A. Zoubir, Editors), Longman/Wiley, Melbourne and New York, 1995, pp. 381-404.

A2. Conference Proceedings

J.C. Campbell, "Resonant-cavity photodetectors," Digest int. Electron Dev. Mtg.,IEDM 95, 575-578 (1995).

B.G. Streetman, J.C. Campbell, and D.G. Deppe, "Microcavity Emitters and Detectors," Future Trends in Microelectronics, S. Luryi ed., Kluwer Press (1995). Proceedings of NATO Advanced Workshop, Ile de Bendor (July, 1995).

S.S. Murtaza, K.A. Anselm, H. Nie, C. Hu, J.C. Campbell, B.G. Streetman, J.C. Bean, and L.J. Peticolas, "Resonant-Cavity Photodetectors for Optimal Communications," pp. 98-106 in Emerging Components and Technologies for All-Optical Networks, SPIE Proc. 2613, (Oct. 24, 1995).
K.A. Anselm, S.S. Murtaza, B.G. Streetman, and J.C. Campbell, "Resonant Cavity Avalanche Photodiodes and Narrow Spectral Response Photodiodes," pp. 184-188 in SPIE Proceedings, vol. 2690, Wavelength Division Multiplying Components (Jan. 1996).

J. Sarathy, K.A. Anselm, B.G. Streetman, and J.C. Campbell, "Very Narrow Linewidth Tunable Distributed Bragg Reflector Photodetector," pp. 189-200 in SPIE Proceedings, vol. 2690, Wavelength Division Multiplying Components (Jan. 1996).

Q. Deng and D. G. Deppe, "Coupling of the Transverse Modes Due to Mirror Reflectivity in a 3-Dimensionally Confined Fabry-Perot Microcavity," SPIE's International Symposium - Photonics West Optoelectronics '97 - - Physics and Simulation of Optoelectronic Devices V, San Jose, CA, February 8-14, 1997.

(Invited) D.L. Huffaker, T.-H. Oh, H. Deng, Q. Deng, and D.G. Deppe, "Oxide-Confined VCSELs Using Half-Wave Cavity and High Contrast Dielectric Mirrors," SPIE's International Symposium - Optoelectronics '97 - Vertical-Cavity Surface-Emitting Lasers, San Jose, CA, February 8-14, 1997.

L.A. Graham, D.L. Huffaker, and D.G. Deppe, "Effects of Steam Oxidation on Interface Recombination Using a Single $In_{0.2}Ga_{0.8}As$ Quantum Well in a Half-Wave Microcavity VCSEL," SPIE's International Symposium - Optoelectronics '97 - Vertical-Cavity Surface-Emitting Lasers, San Jose, CA, February 8-14, 1997.

(Invited) D.G. Deppe, D.L. Huffaker, Q. Deng, T.-H. Oh, and H. Deng, "Lasing Modes in Highly Confined Vertical-Cavity Surface-Emitting Lasers," SPIE's International Symposium - Optoelectronics '97 - Physics and Simulation of Optoelectronic Devices V, San Jose, CA, February 8-14, 1997.

(Invited) J.C. Campbell, J.C. Bean, D.G. Deppe, D.L. Huffaker, and B.G. Streetman, "Resonant-Cavity Photodetectors: Perfomance and Functionality," Proceedings of the SPIE's International Symposium on Optoelectronics Integrated Circuits II, San Jose, CA, January 24-30, 1998.

Q. Deng and D.G. Deppe, "Cavity Length Effect on Lasing Mode of Dielectrically Apertured Fabry-Perot Microcavity," Proceedings of the SPIE's International Symposium on Physics and Simulation of Optoelectronic Devices VI, San Jose, CA, January 24-30, 1998.
J.C. Campbell, "Resonant-cavity photodetectors," Digest Int. Electron Dev. Mtg., IEDM 95, 575-578, 1995.

H. Nie, K.A. Anselm, C. Hu, B.G. Streetman, and J.C. Campbell, "High-speed resonant cavity avalanche photodiodes with separate absorption and multiplication regions," Proceedings SPIE Conf. On Optoelectronic Integrated Circuits, vol. 3006, pp. 48-51, 1997.

J.C. Campbell and J.C. Bean, "GeSi optoelectronic photodetectors," 5th Biennial Dept. of Defense Photonics Conf., pp. 9-12, 1997.

H. Nie, K.A. Anselm, C.Hu, B.G. Streetman, and J.C. Campbell, "High-speed low-noise resonant-cavity avalanche photodiodes," Proceedings 9th Annual Mtg. IEEE Lasers and Electrooptics Soc., vol. 3006, pp. 392-393, 1997.

H. Nie, K. A. Anselm, C. Hu, B. G. Streetman, and J. C. Campbell, "High-speed resonant-cavity avalanche photodiodes with separate absorption and multiplication regions," SPIE Proceedings: Optoelectronic Integrated Circuits, vol. 3006, pp. 48-51 ,1997.

J. C. Campbell, J. C. Bean, D. G. Deppe, D. L. Huffaker, and B. G. Streetman, " Resonant-Cavity Photodetectors: Performance and Functionality," Optoelectronic Integrated Circuits II, pp. 34-40, 1998.

X. Ren and J. C. Campbell, " A Novel Structure: One Mirror Inclined Three-Mirror Cavity High Performance Photodetector," Technical Proceedings International Topical Meeting on Photoelectronics, pp. 81-84, Bejing Institute of Technology Press., 1997.

J. C. Campbell, J. C. Bean, D. G. Deppe, D. L. Huffaker, and B. G. Streetman, " Resonant-Cavity Photodetectors: Performance and Functionality," Proceedings 1997 International Semiconductor Device Research Symposium, pp. 603-606,1997.

M. Rashed, S. Jallepalli, R. Zaman, W.-K. Shih, T. J. T. Kwan and C. M. Maziar, "Monte Carlo Simulation of Electron Transport in Strained Silicon on Relaxed $Si_{1-x}Ge_x$ Substrates," Proceedings of the Eleventh Biennial University/Government/Industry Microelectronics Symposium, May 16-18, 1995, Austin, Texas, pp. 168-171.

M. Peskin and C. M. Maziar, "Monte Carlo Evaluation of Energy Transport Parameters for an Accurate High-Field Energy Balance Model of Charge Transport in GaAs," Proceedings of the Eleventh Biennial University/Government/Industry Microelectronics Symposium, May 16-18, 1995, Austin, Texas, pp. 197-200.

W.-K. Shih, S. Jallepalli, C.-F. Yeap, M. Rashed, C. M. Maziar and A. F. Tasch, Jr., "A Monte Carlo Study on Electron Transport in Silicon nMOSFET Inversion Layers," Proceedings of the International Workshop on Computational Electronics 1995, October 1995, Phoenix, Arizona (proceedings in press).

Mahbub Rashed, W.-K. Shih, S. Jallepalli, R. Zaman, T. J. T. Kwan and C. M. Maziar, "Simulation of Electron Transport in Strained Si/SiGe Heterostructures," Proceedings of the International Workshop on Computational Electronics 1995, October 1995, Phoenix, Arizona (proceedings in press).

Mahbub Rashed, W.-K. Shih, S. Jallepalli, T. J. T. Kwan and C. M. Maziar, "Monte Carlo Simulation of Electron Transport in Strained $Si/Si_{1-x}Ge_x$ n-MOSFETs," Proceedings of the 1995 International Electron Devices Meeting, December 10-13, Washington, D. C., pp. 765-768.

Mark Peskin and Christine Maziar, "MOMENTS: The Modular Monte Carlo Environment for Charge Transport Simulation- An Overview and Applications," presented at the 1997 International Workshop on Computational Electronics, Notre Dame University, South Bend, Indiana, May 28-30, 1997, proceedings in VLSI Design.

W.-K. Shih, S. Jallepalli, M. Rashed, C.M. Maziar and A.F. Tasch, Jr., "Study of Electron Velocity Overshoot in nMOS Inversion Layers, presented at the 1997 International Workshop on Computational Electronics, Notre Dame University, South Bend, Indiana, May 28-30, 1997, proceedings in VLSI Design.

Mark Peskin and Christine Maziar, "MOMENTS: The Modular Monte Carlo Environment for Charge Transport Simulation- An Overview and Applications," presented at the 1997 International Workshop on Computational Electronics, Notre Dame University, South Bend, Indiana, May 28-30, 1997, proceedings in VLSI Design

W.-K. Shih, S. Jallepalli, M. Rashed, C. M. Maziar and A. F. Tasch, Jr., "Study of Electron Velocity Overshoot in nMOS Inversion Layers," presented at the 1997 International Workshop on Computational Electronics, Notre Dame University, South Bend, Indiana, May 28-30, 1997, proceedings in VLSI Design.

J. I. Dadap, X. F. Hu, M. H. Anderson, M. ter Beek, O. A. Aktsipetrov, N. M. Russell, J. G. Ekerdt, and M. C. Downer, "Applications of fs lasers to nonlinear spectroscopy and process control of Si(001) interfaces." in Ultrafast Phenomena X, P. Barbara, W. H. Knox, J. G. Fujimoto, and W. Zinth (Springer Verlag, Heidelberg, 1996.

J. I. Dadap, X. F. Hu, M. H. Anderson, M. C. Downer, M. ter Beek, J. K. Lowell, and O. A. Aktsipetrov, "Second harmonic spectroscopy of the SiO_2/Si(001) interface." in The Physics and Chemistry of SiO_2 and the Si-SiO_2 Interface - 3, H. Z. Massoud, E. H. Poindexter, and C. R. Helms, eds., Proc. Vol. 96-1 (The Electrochemical Society, Pennington, NJ, 1996), pp. 406-417.

H. Ahn, M. K. Grimes, and M. C. Downer, "Femtosecond melting rates of crystalline and amorphous Column IV elements." in Ultrafast Phenomena X, P. Barbara, W. H. Knox, J. G. Fujimoto, and W. Zinth (Springer Verlag, Heidelberg, 1996).

Y.-S. Lee, M. K. Grimes, M. C. Downer, "Analysis of the incipient density gradient on laser-excited Fe and Al surfaces," in International Quantum Electronics Conference (IQEC '96) (Sydney, Australia, 17 July 1996) OSA Technical Digest Series (Optical Society of America, Washington, DC, 1996), pp. 139-140.

J. I. Dadap, X. F. Hu, M. H. Anderson, M. C. Downer, J. K. Lowell, and O. A. Aktsipetrov, "Dependence of optical second harmonic generation on electric field and strain at SiO_2/Si(001) and Si_3N_4/Si(001) interfaces," in International Quantum Electronics Conference (IQEC '96) (Sydney, Australia, 19 July 1996) OSA Technical Digest Series (Optical Society of America, Washington, DC,1996), pp. 254-255.

J. I. Dadap, X. F. Hu, M. ter Beek, M. C. Downer, "Optical second harmonic spectroscopy of the Si(001) E_1 critical point resonance with variable hydrogen coverage," in Quantum Electronics and Laser Science (QELS '96) (Anaheim, CA, 7 June 1996) OSA Technical Digest Series (Optical Society of America, Washington, DC, 1996), pp. 271-272.

J. I. Dadap, X. F. Hu, M. H. Anderson, M. C. Downer, J. K. Lowell, and O. A. Aktsipetrov,"Separation of bulk and interface contributions by optical second harmonic electroreflectance spectroscopy of a Si(001) metal-oxide-semiconductor structure," in Quantum Electronics and Laser Science (QELS '96) (Anaheim, CA, 7 June 1996) OSA Technical Digest Series (Optical Society of America, Washington, DC, 1996), pp. 135-136.

O.A. Aktsipetrov, E. D. Mishina, A. A. Nikulin, A.N. Rubtsov, M.H. Anderson, P. T. Wilson, M. ter Beek, and M.C. Downer, "Surface-quantization in DC-electric field induced second harmonic generation from MOS structure," Quantum Electronics and Laser Science Conference (QELS '97), paper QThG44.

M. C. Downer and Y. -S. Lee, "Fourth harmonic generation at crystalline Si(001) interfaces," International Quantum Electronics Conference (IQEC '98), vol. 7, 1998 OSA Technical Digest Series (Optical Society of America, Washington DC 1998), pp. 214-215. Paper QFC1, presented in San Francisco, 8 May 1998.

A. Fedyanin, A. V. Melnikov, E. D. Mishina, A. N. Rubtsov, O. A. Aktsipetrov, M. H. Anderson, P. T. Wilson, M. ter Beek, X. F. Hu, J. I. Dadap, M. C. Downer, "DC-electric-field-induced and low-frequency electromodulation second-harmonic generation spectroscopy of Si(001)-SiO_2 interface," International Quantum Electronics Conference (IQEC '98), vol. 7, 1998 OSA Technical Digest Series (Optical Society of America, Washington DC 1998), pp. 242-243. Paper QFH7, presented in San Francisco, 8 May 1998.

M. K. Grimes, Y. -S. Lee, and M. C. Downer, "Resonance vs Brunel absortpion in the solid to plasma transition of fs-laser-irradiatied iron and aluminum," 11th International Conference on Ultrafast Phenomena, paper TuA3, Garmisch-Partenkirchen, Germany, 14 July 1998.

Y.-S. Lee, D. Lim, Y. Jiang, P. T. Wilson, J. G. Ekerdt, M. C. Downer, "New Directions in Nonlinear Surface Spectroscopy Enabled by Ultrafast Lasers," 11th International Conference on Ultrafast Phenomena, paper ThP34, Garmisch-Partenkirchen, Germany, 16 July 1998.

R. Bhalla and H. Ling, "Xpatch simulation of large inlet structures," 11th Annual Review of Progress in Applied Computational Electromagnetics, Monterey, CA, March 1995. (Invited Talk)

R. Bhalla and H. Ling, "Multi-aspect range profile interpolation for the shooting and bouncing ray technique," International IEEE AP-S Symposium, pp. 1902-1905, Newport Beach, CA, June 1995.

R. Bhalla and H. Ling, "3D scattering center extraction from Xpatch," International IEEE AP-S Symposium, pp. 1906-1909, Newport Beach, CA, June 1995.

L. C. Trintinalia and H. Ling, "Super-resolved parameterization of dispersive scattering mechanisms in the time-frequency plane," International IEEE AP-S Symposium, pp. 320-323, Newport Beach, CA, June 1995.

L. C. Trintinalia and H. Ling, "Time-frequency representation of wideband radar echo using adaptive normalized Gaussian functions," International IEEE AP-S Symposium, pp. 324-327, Newport Beach, CA, June 1995.

H. Kim and H. Ling, "A fast multiresolution moment method algorithm using wavelet concepts," International IEEE AP-S Symposium, pp. 312-315, Newport Beach, CA, June 1995.

L. C. Trintinalia and H. Ling, "High-resolution parameterization of dispersive scattering mechanisms in the time-frequency plane," Progress in Electromagnetics Research Symposium, p. 269, Seattle, WA, July 1995.

J. Moore and H. Ling, "Super-resolved time-frequency processing of backscattered data containing surface wave mechanisms," Progress in Electromagnetics Research Symposium, p. 270, Seattle, WA, July 1995.

L. C. Trintinalia, H. Ling and S. Qian, "Joint time-frequency ISAR image processing using adaptive Gaussian basis functions," UK Symposium on Applications of Time-Frequency and Time-Scale Methods, pp. 74-81, Coventry, England, August 1995.

H. Ling, "Joint time-frequency analysis of electromagnetic backscattered data," International Symposium on Signals, Systems and Electronics, Special Session on Time-Frequency Application, pp. 243-246, San Francisco, CA, October 1995. (Tutorial Paper)

L. C. Trintinalia and H. Ling, "A joint time-frequency ISAR algorithm for imaging targets gets with non-point scattering features," International Symposium on Signals, Systems and Electronics, Special Session on Time-Frequency Application, pp. 247-250, San Francisco, CA, October 1995.

L. C. Trintinalia and H. Ling, "Joint time-frequency ISAR using adaptive processing," National Radio Science Meeting, Boulder, CO, January 1996 (1st Place, Student Paper Competition).

L. C. Trintinalia and H. Ling, "Feature extraction from electromagnetic backscattered data using joint time-frequency processing," Third International Conference on Ultra-Wideband, Short-Pulse Electromagnetics, p. 209, Albuquerque, NM, May 1996.

L. C. Trintinalia and H. Ling, "Feature extraction for electrically large ducts using adaptive Gaussian processing," International IEEE AP-S Symposium, pp. 626-629, Baltimore, MD, July 1996.

C. Ozdemir and H. Ling, "Intepretation of scattering phenomenology in dielectric-coated wire via time-frequency processing," International IEEE AP-S Symposium, pp. 630-633, Baltimore, MD, July 1996.

R. Bhalla, J. Moore and H. Ling, "3D scattering center model of complex targets," URSI Radio Science Meeting, p. 15, Baltimore, MD, July 1996.

H. Ling, Y. Wang and V. Chen, "ISAR image formation and feature extraction using adaptive joint time-frequency processing," SPIE AeroSense '97, Wavelet Applications, pp. 424-432, Orlando, FL, April 1997.

G. Whitehead, Y. Wang, R. Bhalla and H. Ling, "Feature extraction from radar signatures using adaptive Gaussian representation," Progress in Electromagnetics Research Symposium, p. 792, Boston, MA, July 1997.

Y. Wang, L. C. Trintinalia and H. Ling, "Parameter extraction for microstrip components via FDTD and superresolution techniques," International IEEE AP-S Symposium, pp. 2152-2155, Montreal, Canada, July 1997.

C. Ozdemir, L. C. Trintinalia and H. Ling, "Antenna synthetic aperture radar (ASAR) image formation," International IEEE AP-S Symposium, pp. 2601-2604, Montreal, Canada, July 1997.

C. Ozdemir, R. Bhalla and H. Ling, "Fast ASAR image formation using the shooting and bouncing ray technique," International IEEE AP-S Symposium, pp. 2605-2608, Montreal, Canada, July 1997.

Y. Wang, H. Ling and V.C. Chen, "ISAR imaging of targets with fast rotating parts using adaptive joint time-frequency processing," SPIE AeroSense '98, Wavelet Applications, Orlando, FL, April 1998.

H. Ling, "Joint time-frequency processing of electromagnetic backscattered data," SPIE AeroSense '98, Wavelet Applications, Orlando, FL, April 1998. (Invited Talk)

Y. Wang and H. Ling, "ISAR image formation from unevenly undersampled data using adaptive feature extraction," International IEEE AP-S Symposium, pp. 350-353, Atlanta, GA, June 1998.

H. Deng and H. Ling, "Application of adaptive wavelet packet basis to solving electromagnetic integral equations," International IEEE AP-S Symposium, pp. 1740-1743, Atlanta, GA, June 1998.

Y. Wang, H. Ling and V.C. Chen, ISAR feature extraction from targets with rotating components using adaptive joint time-frequency processing," URSI Radio Science Meeting, p. 23, Atlanta, GA, June 1998.

Y. Wang, H. Ling and V.C. Chen, "Application of adaptive joint time-frequency processing to ISAR image enhancement and Doppler feature extraction for targets with rotating parts," SPIE 43rd Annual Meeting, Radar Processing, Technology, and Applications, San Diego, CA, July 1998.

S.S. Jeng, G. Xu, H.P. Lin, and W.J. Vogel, "Experimental Study of Antenna Arrays in Indoor Wireless Applications", Proc. 29th Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, CA, Nov. 1995.

M. Torlak and G. Xu, "Performance of CDMA Smart Antenna Systems", Proc. 29th Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, CA, Nov. 1995.

G. Okamoto and G. Xu, "Throughput Multipcation of Wireless LANs for Multimedia Services: Spread Spectrum with SDMA", Proc. 46th Vehicular Technology Conf., Atlanta, GA, April 1996.

G. Xu, M. Torlak, and H. Liu, "Self-Recovery in Anti-Jamming Communications, Proc. 1996 International Conference of Acoustics, Speech and Signal Processing, Atlanta, GA, May 1996.

M. Torlak, H. Liu, and G. Xu, "An Improved Signature Waveform Approach Exploiting Pulse Shaping Information in Synchronous CDMA Systems, Proc. 1996 International Conference on Communications, Dallas, TX, July 1996.

S.S. Jeng, H-P Lin, G. Okamoto, and G. Xu, "Multipath Direction Finding with Subspace Smoothing," Proc. Of 11th IFAC Symposium on System Identification, Kilakyshu, Japan, July 1997.

W. Yang and G. Xu, "Designing Smart Antenna Downlink Weighting Vectors Based on the Filter Bank Concept," Proc. Of SPIE '97, San Diego, CA, July 1997.

S.S. Jeng, H-P. Lin, G. Okamoto, G. Xu and W.J. Vogel, "Multipath Direction Finding with Subspace Smoothing," Proc. Of ICASSP'97, Munich, Germany, April 1997.

L.K. Hansen and G. Xu, "A Test Statistic for Sequential Identification of Co-channel Digital Signals Using a Deflating Approach," Proc. Of ICASSP'97, Munich, Germany, April 1997.

M. Torlak, G. Xu, B.L. Evans, and H. Liu, "Estimation of Optimal Weight Vectors for Spatial Broadcast Channels," Proc. of ICASP'97, Munich, Germany, April 1997.

M. Torlak and G. Xu, "Minimum Distance of Space-Division-Multiple-Access Channels," Proc. of VTC'97, Phoenix, AZ, May 1997.

G. Okamoto and G. Xu, "The Smart Wireless LAN System: Physical Layer Design and Results, Proc. of VTC'97, Phoenix, AZ, May 1997.

G. Okamoto and G. Xu, "Multimedia Communications over Wireless LANs via the SWL Protocol," Proceedings of 30th Annual Hawaii International Conference on System Science, Maui, Hawaii, Jan. 1997.

M. Torlak, G. Xu, B.L. Evans, and H. Liu, "Optimal Weight Vectors for Broadcast Channels," Proc. of 30th Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, CA, Nov. 1997.

L.K. Hansen and G. Xu, "A Fast Algorithm for the Blind Separation of Digital Co-channel Signals," Proc. of 30th Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, CA, Nov. 1997.

M. Torlak and G. Xu, "Maximum Likelihood Detection of Co-channel Communication Signals Exploiting the Spatial-Temporal Diversity," Proc. of 30th Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, CA, Nov. 1997.

J.M. Ashe, W. Yang, T. Shen, G. Xu and S.D. Silverstein, "Experimental Study of Remote Calibration Algorithms for Active Phased Array Transmitters, Proc. of 30th Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, CA, Nov. 1997.

Yang, A. Kavak, and G. Xu, "Experimental Study of Doppler Effect in Wireless Communications Problem," IEEE Trans. on Information Theory, Vol. 43, No. 5, pp. 1536-1548, Sept. 1997.

Okamoto, S.S. Jeng, S. Tseng, and G. Xu, "Evaluation of Beamforming Algorithm Effectiveness for the Smart Wireless LAN System, Proc. VTC'98, Ottawa, Canada, May 1998.

Jeng, G. Okamoto, and G. Xu, "Experimental Evaluation of Fading Reduction and Diversity Gain for Smart Antenna Systems," Proc. VTC'98, Ottawa, Canada, May 1998.

Torlak, L. Hansen, and G. Xu, "A Fast Blind Source Separation for Digital Wireless Applications, Proc. ICASSP'98, Seattle, WA, May 1998.

Yang, and G. Xu, "Optimal Downlink Power Assignment for Smart Antenna Systems, Proc. ICASSP '98, Seattle, WA, May 1998.

E.J. Powers, S. Im, A.Duggal and P. Johnson, "Applications of Higher-Order Statistics to Nonlinear Hydrodynamics," Proceedings of the IEEE Signal Processing/ATHOS Workshop on Higher-Order Statistics, Begur, Girona, Spain, June 12-14, 1995, pp. 414-418.

S. Im and E.J. Powers, "Extended Principal Domain for Volterra Models," Proceedings of the IEEE Signal Processing/ATHOS Workshop on Higher-Order Statistics, Begur, Girona, Spain, June 12-14, 1995, pp. 381-385.

A.S. Duggal, P. Johnson, S. Im, I.-S. Park and E.J. Powers, "Nonlinear Decomposition of Laboratory Generated Irregular Waves," Proceedings of the 14th International Conference on Offshore Mechanics and Arctic Engineering, Copenhagen, Denmark, June 18-22, 1995, Vol. 1, pp. 1-8.

S. Im and E.J. Powers, "A Third-Order Frequency-Domain Adaptive Filter," Proceedings of the 1995 IEEE Workshop on Nonlinear Image and Signal Processing, Neos, Marmaros, Hakidiki, Greece, June 20-22, 1995, pp. 931-934.

In-Seung Park, Joydeep Ghosh and Edward J. Powers, "Utilization of Neural Networks to Model and Predict Nonlinear Random Sea Waves," Proceedings of the International Conference on Signal Processing Applications and Technology, Boston, Massachusetts, October 24-26, 1995, Vol. II, pp. 1449-1453.

I.S. Park, S. Im , E.J. Powers, A. Duggal and P. Johnson, "Nonlinear Characteristics of Laboratory-Generated Irregular Waves," Proceedings of the Twenty-Fourth American Towing Tank Conference, College Station, Texas, November 2-3, 1995, pp. 79-85.

C. Eun and E.J. Powers, "A Predistorter Design for a Memory-less Nonlinearity Preceded by a Dynamic Linear System," Proceedings of IEEE Gobal Telecommunications Conference (GLOBECOM '95), November 13-17, 1995, Singapore, Vol. 1, pp. 152-156.

I.-S. Park and E.J. Powers, "A New Predistorter Design Technique for Nonlinear Digital Communication Channels," Proceedings of the Fourth International Symposium on Signal Processing and its Applications, Gold Coast, Queensland, Australia, August 25-30, 1996, pp. 618-621.

S. Mehta and E.J. Powers, "Wavelet-based Higher-Order Time-Scale Analysis," Proceedings of Wavelet Applications in Signal and Image Processing IV, Conference 2825, SPIE International Symposium on Optical Science, Engineering, and Instrumentation, Denver, Colorado, August 4-9, 1996, Vol. 2825, pp. 561-569.

S. Mehta, E.J. Powers and I.-S. Park, "Detection of Short-term Nonlinear Phenomena Using Higher-order Wavelet-based Spectra," Proceedings of the Fourth International Symposium on Signal Processing and its Applications, Gold Coast, Queensland, Australia, August 25-30, 1996, pp. 646-649.

H. Yoo and E.J. Powers, "Windows and Volterra Transfer Function Estimation," Proceedings of the IEEE Signal Processing Workshop on Higher-Order Statistics, Banff, Alberta, Canada, July 21-23, 1997, pp. 157-161.

H. Kwan, R.L. Nelson, Jr., and E.E. Swartzlander, Jr., E.J. Powers, "Three-dimensional FFTs on a Parallel Digital-Signal Processor, with No Interprocessor Communication," Proceedings of the Thirtieth Asilomar Conference on Signals, System and Computers, Pacific Grove, California, 1996, Vol. 1, pp. 440-444.

H. Kwan, S. Im, E.J. Powers and E.E. Swartzlander, Jr., "Parallel Implementation of a Fast Third-Order Volterra Digital Filter," Proceedings of the 1997 IEEE International Symposium on Circuits and Systems, Hong Kong, June 9-12, 1997, Vol. IV, pp. 2473-2476.

S. Santoso, and E.J. Powers, "Development of a Linear Time-Scale Coherence Spectrum," Proceedings of Wavelet Applications in Signal and Image Processing IV, Conference 2825, SPIE International Symposium on Optical Science, Engineering, and Instrumentation, Denver, Colorado, August 4-9, 1996, Vol. 2825, pp. 992-1002.

H. Kwan, E.J. Powers and E.E. Swartzlander, Jr., "Realization of a Nonlinear Digital Filter On a DSP Array Processor," Proceedings of the IEEE International Conference on Application-Specific Systems, Architectures, and Processors, Zurich, Switzerland, July 14-16, 1997, 10 pages.

H. Kwan, E.J. Powers and E.E. Swartzlander, Jr., "Analysis of Execution Time Distributions of a Nonlinear Digital Filter," submitted to the Thirty-First Asilomar Conference on Signals, System and Computers.

I.-S. Park, E.J. Powers and G. Xu, "Parallel Adaptive Predistortion for RF Power Amplifier Linearization," Proceedings of the IEEE Global Communications Conference (GLOBECOM '97), Phoenix, Arizona, November 3-8, 1997, Vol. 1, pp. 82-86.

E.J. Powers, I.-S. Park, S. Im, S. Mehta and E.-J. Yi, "Higher-Order Statistics and Extreme Waves," Proceedings of the IEEE Signal Processing Workshop on Higher-Order Statistics, Banff, Alberta, Canada, pp. 98-102.

H. Yoo, E.J. Powers, D.C. Weggel and J.M. Roesset, "Recovery of Second-Order Force via Higher-Order Statistical Signal Processing," Proceedings of the International Conference on Signal Processing Applications and Technology (ICSPAT '96), Boston, Massachusetts, October 7-10, 1996, Vol. 2, pp. 1234-1238.

H. Yoo, D.C. Weggel, E.J. Powers and J.M. Roesset, "First- and Second-Order Wave Forces on a Large Spar Platform," Proceedings of the Seventh (1997) International Offshore and Polar Engineering Conference (ISOPE), Honolulu, Hawaii, May 25-30, 1997, vol. 1, pp. 215-220.

Hercule Kwan, Edward J. Powers, and Earl E. Swartzlander, Jr., "Analysis and ExecutionTime

Distributions of a Nonlinear Digital Filter," Conference Record of The Thirty-First Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, California, November 2-5, 1997, pp. 116-120.

In-Seung Park and Edward J. Powers, "An adaptive Predistorter for High Power Amplifiers," Conference Record of The Thirty-First Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, California, November 2-5, 1997, pp. 8-12.

In-Seung Park, Edward J. Powers, and Guanghan Xu, "Parallel Adaptive Predistortion for RF Power Amplifier Linearization," Conference Record of the 1997 IEEE Global Telecommunications Conference, Phoenix, Arizona, November 3-8, 1997, Vol. 1, pp. 82-86.

Sungbin Im, Edward J. Powers, and In-Seung Park, "Advanced Volterra Models for Fluid-Structure Interactions," Proceedings of the 1998 International OTRC Symposium-Ocean Wave Kinematics, Dynamics and Loads on Structures, Houston, Texas, April 30 - May 1, 1998, pp. 249-256.

E.J. Powers, E.-J. Yi, P. Beynet, and S. Bhat, "Higher-Order Spectral Analysis of TLP Tendon-Tension Data," Paper OTC 8662 in Proceedings of the 1998 Offshore Technology Conference, Houston, Texas, May 4-7, 1998, pp. 319-323.

E.J. Powers, E.-J Yi, I.-S. Park, and J.-H. Chang, "Wavelet-Based Bichoherence Analysis of Irregular Wave Data," Proceedings of the Eighth (1998) International Offshore and Polar Engineering Conference, Montreal, Canada, May 24-29, 1998, Vol. III, pp. 170-175.

Chi-Hao Cheng and Edward J. Powers, "Optimal Third-Order Volterra Kernel Estimation Algorithms for Nonlinear Communication System Under PSK and QAM Inputs," Proceedings of the Eighth IEEE Digital Signal Processing Workshop, Bryce, Utah, August 9-12, 1998, 4 pages (CD ROM).